ELSEVIER

Journal of Petroleum Science and Engineering 33 (2002) 173–183

JOURNAL OF PETROLEUM SCIENCE & ENGINEERING

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Estimation of the adsorption capacity of oil-bearing rocks: a method and its prospects

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Abstract

The adsorption capacity of natural cores of the oil-bearing rocks has been studied by using vapor-phase gas chromatography (statistical method). The thermodynamic parameters of sorption of reservoir rocks (dried, after extraction of oil) are determined by the mineralogical composition of cement in the sandstone cores. The presence of water decreases the adsorption capacity. However, if the rock contains kaolinite, the sorption of hydrocarbons increased 10-fold in the presence of water. The adsorption capacity of the oil-bearing rock is related to the combined properties of organo–mineral complexes. © 2002 Published by Elsevier Science B.V.

Keywords: Adsorption; Wettability; Reservoir rocks; Mineralogical composition

1. Introduction

The depletion of oil reserves and limitations of even the most up-to-date oil recovery technology, which makes it possible to extract, on the average, no more than a half of the potential of ''in situ'' oil, are the primary motivations for all enhanced oil recovery research. A good understanding of the origin of the physicochemical adsorption processes that occur at the oil–mineral matrix interface is required to develop advanced recovery technology for producing oil formations. The molecular-surface interactions in the reservoir rock–oil system depend on the surface area of solid and on the presence of active sites on the solid surface. In many cases, the inner surface of the rock consists of several minerals, which have both different surface chemistry and sorption properties. In addition, natural sandstones and clays have mixed acid–base properties and contain both acidic and basic adsorption sites. Therefore, both physical and chemical adsorption can take place on their surfaces.

Thus, interactions in oil–brine–rock systems need to be systematically investigated. An objective of this study is to determine the effects of the mineralogical composition of the rock cement, of the presence of water, and of a film of adsorbed oil on the adsorption

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0920-4105/02/$ - see front matter © 2002 Published by Elsevier Science B.V.
PII: S0920-4105(01)00184-X